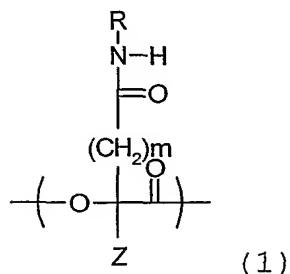


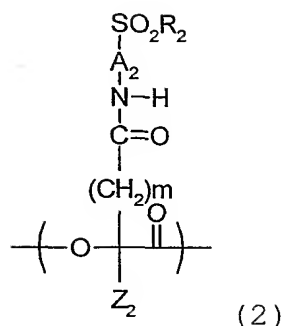
CLAIMS

1. Polyhydroxyalkanoate comprised of at least a unit represented by a chemical formula (1) within the molecule:

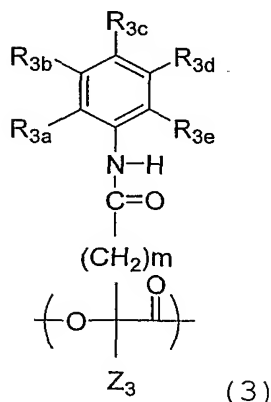


wherein R represents $-\text{A}_1-\text{SO}_2\text{R}_1$; R_1 represents OH, a halogen atom, ONa, OK or OR_{1a} ; R_{1a} and A_1 each independently represents a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure or a substituted or unsubstituted heterocyclic structure; m represents an integer selected from 0 - 8; Z represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group; and in case plural units are present, R, R_1 , R_{1a} , A_1 , m and Z have the aforementioned meanings independently for each unit.

2. Polyhydroxyalkanoate according to claim 1, comprised of, as the unit represented by the chemical formula (1), at least a unit represented by a chemical formula (2), a chemical formula (3), a chemical formula (4A) or (4B), within a molecule:

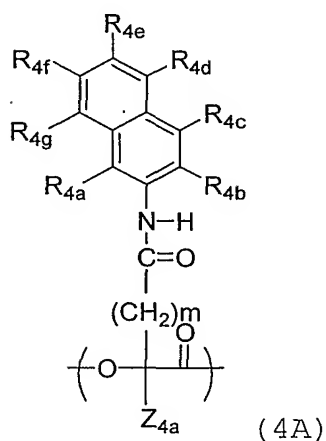


wherein R_2 represents OH, a halogen atom, ONa, OK or OR_{2a} ; R_{2a} represents a linear or branched alkyl group with 1 to 8 carbon atoms or a substituted or unsubstituted phenyl group; A_2 represents a linear or branched alkylene group with 1 to 8 carbon atoms; m represents an integer selected from 0 - 8; Z_2 represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group; and in case plural units are present, A_2 , R_2 , R_{2a} , m and Z_2 have the aforementioned meanings independently for each unit;



wherein R_{3a} , R_{3b} , R_{3c} , R_{3d} and R_{3e} each independently represents SO_2R_{3f} (R_{3f} representing OH, a halogen atom, ONa, OK or OR_{3f1} (R_{3f1} representing a linear or branched

alkyl group with 1 to 8 carbon atoms or a substituted or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl group with 1 - 20 carbon atoms, an alkoxy group with 1 - 20 carbon atoms, an OH group, an NH₂ group, an NO₂ group, COOR_{3g} (R_{3g} representing a H atom, a Na atom or a K atom), an acetamide group, an OPh group, a NPh group, a CF₃ group, a C₂F₅ group or a C₃F₇ group (Ph indicating a phenyl group), of which at least one is SO₂R_{3f}; m represents an integer selected from 0 - 8; Z₃ represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group; and in case plural units are present, R_{3a}, R_{3b}, R_{3c}, R_{3d}, R_{3e}, R_{3f}, R_{3f1}, R_{3g}, m and Z₃ have the aforementioned meanings independently for each unit;

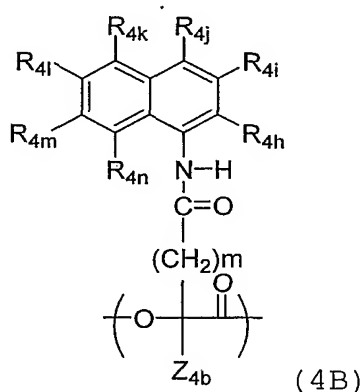


wherein R_{4a}, R_{4b}, R_{4c}, R_{4d}, R_{4e}, R_{4f} and R_{4g} each independently represents SO₂R_{4o} (R_{4o} representing OH, a halogen atom, ONa, OK or OR_{4o1} (R_{4o1} representing a linear or branched alkyl group with 1 to 8 carbon

atoms or a substituted or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl group with 1 - 20 carbon atoms, an alkoxy group with 1 - 20 carbon atoms, an OH group, an NH₂ group, an NO₂ group, COOR_{4p} (R_{4p} representing a H atom, a Na atom or a K atom), an acetamide group, an OPh group, an NHPh group, a CF₃ group, a C₂F₅ group or a C₃F₇ group (Ph indicating a phenyl group), of which at least one is SO₂R_{4o}; m represents an integer selected from 0 - 8;

10 Z_{4a} represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group; and in case plural units are present, R_{4a}, R_{4b}, R_{4c}, R_{4d}, R_{4e}, R_{4f}, R_{4g}, R_{4o}, R_{4o1}, R_{4p}, m and Z_{4a} have the aforementioned meanings independently for each

15 unit;

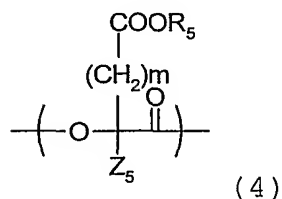


wherein R_{4h}, R_{4i}, R_{4j}, R_{4k}, R_{4l}, R_{4m} and R_{4n} each independently represents SO₂R_{4o} (R_{4o} representing OH, a halogen atom, ONa, OK or OR_{4o1} (R_{4o1} representing a

20 linear or branched alkyl group with 1 to 8 carbon atoms or a substituted or unsubstituted phenyl

group)), a hydrogen atom, a halogen atom, an alkyl group with 1 - 20 carbon atoms, an alkoxy group with 1 - 20 carbon atoms, an OH group, an NH₂ group, an NO₂ group, COOR_{4p} (R_{4p} representing a H atom, a Na atom or a K atom), an acetamide group, an OPh group, an NHPPh group, a CF₃ group, a C₂F₅ group or a C₃F₇ group (Ph indicating a phenyl group), of which at least one is SO₂R_{4o}; m represents an integer selected from 0 - 8; Z_{4b} represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group; and in case plural units are present, R_{4h}, R_{4i}, R_{4j}, R_{4k}, R_{4l}, R_{4m}, R_{4n}, R_{4o}, R_{4ol}, R_{4p}, m and Z_{4b} have the aforementioned meanings independently for each unit.

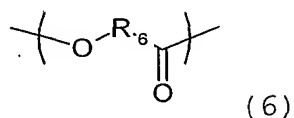
3. Polyhydroxyalkanoate comprised of at least a unit represented by a chemical formula (5) within a molecule:



wherein R₅ represents hydrogen, a group capable of forming a salt or R_{5a}; R_{5a} represents a linear or branched alkyl group with 1 - 12 carbon atoms, an aralkyl group or a substituent having a sugar; m represents an integer selected from 0 - 8; Z₅ represents a linear or branched alkyl group, an aryl

group or an aralkyl group substituted with an aryl group; however R_5 only represents a substituent having a sugar in case Z_5 is a methyl group and m is 0 - 1; and in case plural units are present, R_5 , R_{5a} , m and Z_5 have the aforementioned meanings independently for each unit.

4. Polyhydroxyalkanoate according to any one of claims 1 to 3, further comprised of a unit represented by a chemical formula (6) within a molecule:

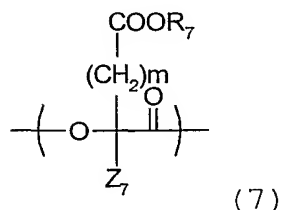


wherein R_6 represents a linear or branched alkylene with 1 - 11 carbon atoms, alkyleneoxyalkylene group (each alkylene group being independently with 1 - 2 carbon atoms), a linear or branched alkenyl group with 1 - 11 carbon atoms or an alkylidene group with 1 - 5 carbon atoms which may be substituted with an aryl group; and in case plural units are present, R_6 has the aforementioned meanings independently for each unit.

5. A method for producing a polyhydroxyalkanoate comprising a unit represented by a chemical formula (8), comprised of a step of executing hydrolysis of a polyhydroxyalkanoate comprising a unit represented by a chemical formula

(7) in the presence of an acid or an alkali, or a step of executing hydrogenolysis comprising a catalytic reduction of a polyhydroxyalkanoate comprising a unit represented by a chemical formula

5 (7):

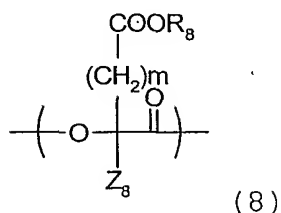


wherein R_7 represents a linear or branched alkyl group with 1 - 12 carbon atoms or an aralkyl group; m represents an integer selected from 0 - 8; Z_7 represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group, and m represents an integer selected from 2 - 8 in case Z_7 is a methyl group; and in case plural units are present, R_7 , m and Z_7 have the

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aforementioned meanings independently for each unit;

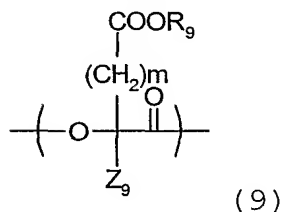


wherein R_8 represents hydrogen, or a group capable of forming a salt; m represents an integer selected from 0 - 8; Z_8 represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group, and m represents an integer selected from

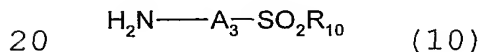
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2 - 8 in case Z_8 is a methyl group; and, in case plural units are present, R_8 , m and Z_8 have the aforementioned meanings independently for each unit.

6. A method for producing a
- 5 polyhydroxyalkanoate comprising a unit represented by a chemical formula (1), comprised of a step of executing a condensation reaction of a polyhydroxyalkanoate comprising a unit represented by a chemical formula (9) and an amine compound
- 10 represented by a chemical formula (10):

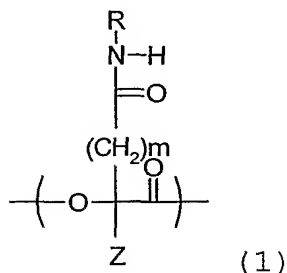


- wherein R_9 represents hydrogen, or a group capable of forming a salt; m represents an integer selected from 0 - 8; Z_9 represents a linear or branched alkyl group,
- 15 an aryl group or an aralkyl group substituted with an aryl group; and, in case plural units are present, m , R_9 and Z_9 have the aforementioned meanings independently for each unit;



wherein R_{10} represents OH, a halogen atom, ONa, OK or OR_{10a} ; R_{10a} and A_3 each independently is selected from a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted

aromatic ring structure, or a substituted or unsubstituted heterocyclic structure; and, in case plural units are present, R_{10} , R_{10a} and A_3 have the aforementioned meanings independently for each unit;

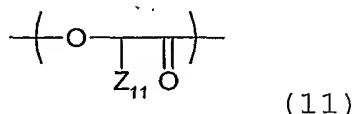


wherein R represents $-A_1-SO_2R_1$; R_1 represents OH , a halogen atom, ONa , OK or OR_{1a} ; R_{1a} and A_1 each independently represents a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure or a substituted or unsubstituted heterocyclic structure; m represents an integer selected from 0 - 8; Z represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted with an aryl group; and in case plural units are present, R , R_1 , R_{1a} , A_1 , m and Z have the aforementioned meanings independently for each unit.

7. A method for producing a polyhydroxyalkanoate comprising a unit represented by a chemical formula (13), comprised of:

a step of reacting a polyhydroxyalkanoate comprising a unit represented by a chemical formula (11) with a base; and

a step of reacting a compound obtained in the
aforementioned step with a compound represented by a
chemical formula (12):



5 wherein Z_{11} represents a linear or branched alkyl
group, an aryl group or an aralkyl group substituted
with an aryl group; and in case plural units are
present, Z_{11} has the aforementioned meanings
independently for each unit;

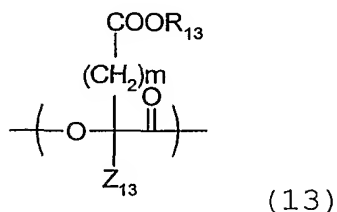
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wherein m represents an integer selected from 0 - 8;

X represents a halogen atom; and R_{12} represents a
linear or branched alkyl group with 1 - 12 carbon

15 atoms or an aralkyl group;



wherein m represents an integer selected from 0 - 8;

R_{13} represents a linear or branched alkyl group with 1
- 12 carbon atoms or an aralkyl group; Z_{13} represents

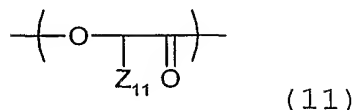
20 a linear or branched alkyl group, an aryl group or an
aralkyl group substituted with an aryl group, and m
represents an integer selected from 2 - 8 in case Z_{13}

is a methyl group; and in case plural units are present, R_{13} , m and Z_{13} have the aforementioned meanings independently for each unit.

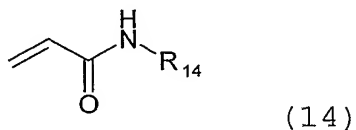
8. A method for producing a
5 polyhydroxyalkanoate comprising a unit represented by a chemical formula (15), comprised of:

a step of reacting a polyhydroxyalkanoate comprising a unit represented by a chemical formula (11) with a base; and

10 a step of reacting a compound obtained in the aforementioned step with a compound represented by a chemical formula (14):



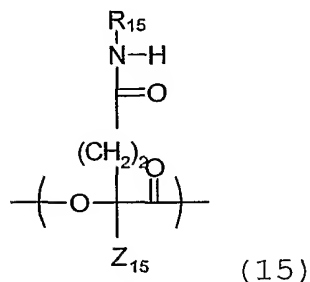
wherein Z_{11} represents a linear or branched alkyl
15 group, an aryl group or an aralkyl group substituted with an aryl group; and in case plural units are present, Z_{11} has the aforementioned meanings independently for each unit;



20 wherein R_{14} represents $-\text{A}_{14}-\text{SO}_2\text{R}_{14a}$; R_{14a} represents OH, a halogen atom, ONa, OK or OR_{14b} ; R_{14b} and A_{14} each independently is selected from a group having a substituted or unsubstituted aliphatic hydrocarbon

structure, a substituted or unsubstituted aromatic ring structure or a substituted or unsubstituted heterocyclic structure; and in case plural units are present, R_{14} , R_{14a} , R_{14b} , and A_{14} have the

5 aforementioned meanings independently for each unit;



wherein R_{15} represents $-A_{15}-SO_2R_{15a}$; R_{15a} represents OH, a halogen atom, ONa, OK or OR_{15b} ; R_{15b} and A_{15} each independently represents a group having a substituted

10 or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure or a substituted or unsubstituted heterocyclic structure; Z_{15} represents a linear or branched alkyl group, an aryl group or an aralkyl group substituted

15 with an aryl group; and in case plural units are present, R_{15} , R_{15a} , R_{15b} , and A_{15} have the aforementioned meanings independently for each unit.